

## CLAIMS

What is claimed is:

1. A scroll machine comprising:
  - an outer shell;
  - a first scroll compressor disposed within said outer shell;
  - a second scroll compressor disposed within said outer shell;
  - a drive shaft extending between said first and second scroll compressors, said drive shaft having a first drive flat at a first end engaging said first scroll compressor and a second drive flat at a first end engaging said second scroll compressor, said first and second drive flats being out of rotational phase with one another by 180°; and
  - a motor disposed within said outer shell between said first and second scroll compressors, said motor being drivingly coupled to said drive shaft for rotatably driving said drive shaft.
2. The scroll machine in accordance with Claim 1, wherein said motor comprises:
  - a stator attached to said outer shell; and
  - a rotor attached to said drive shaft.
3. The scroll machine in accordance with Claim 1, wherein said first scroll compressor comprises:

a first scroll member having a first spiral wrap projecting outwardly from a first end plate;

a second scroll member having a second spiral wrap projecting outwardly from a second end plate, said second scroll wrap being interleaved with said first spiral wrap to define a first plurality of moving chambers therebetween when said second scroll member orbits with respect to said first scroll member; and

a first main bearing housing attached to said outer shell, said first main bearing housing rotatably supporting said drive shaft.

4. The scroll machine in accordance with Claim 3, wherein said second scroll compressor comprises:

a third scroll compressor having a third spiral wrap projecting outwardly from a third end plate;

a fourth scroll member having a fourth spiral wrap projecting outwardly from a fourth end plate, said fourth scroll wrap being interleaved with said third spiral wrap to define a second plurality of moving chambers therebetween when said fourth scroll member orbits with respect to said third scroll member; and

a second main bearing housing attached to said outer shell, said second main bearing housing rotatably supporting said drive shaft.

5. The scroll machine in accordance with Claim 1, wherein said outer shell defines a suction pressure chamber in communication with said first and second scroll compressors, a first discharge pressure chamber in communication with said first scroll compressor and a second discharge chamber in communication with said second scroll compressor.

6. The scroll machine in accordance with Claim 5, wherein said first and second scroll compressors are disposed within said suction pressure chamber.

7. The scroll machine in accordance with Claim 1, further comprising a first capacity modulation system for varying the capacity of said first scroll compressor.

8. The scroll machine in accordance with Claim 7, wherein said first capacity modulation system includes a pulse width modulation system.

9. The scroll machine in accordance with Claim 8, further comprising a second capacity modulation system for varying the capacity of said second scroll compressor.

10. The scroll machine in accordance with Claim 9, wherein said first capacity modulation system includes a first pulse width modulation system and

said second capacity modulation system includes a second pulse width modulation system.

11. The scroll machine in accordance with Claim 1, wherein said motor is a variable speed motor.

12. A scroll machine comprising:

an outer shell defining a central shell and a discharge duct having a discharge port, said discharge duct being spaced from said central shell;

a first scroll compressor disposed within said outer shell, said first scroll compressor providing compressed fluid to a first discharge chamber in communication with said discharge duct;

a second scroll compressor disposed within said outer shell, said second scroll compressor providing compressed fluid to a second discharge chamber in communication with said discharge duct;

a draft shaft extending between and couple to each of said first and second scroll compressors; and

a motor disposed within said outer shell between said first and second scroll compressors, said motor being drivingly coupled to said drive shaft.

13. The scroll machine according to Claim 12 wherein said outer shell defines a suction duct having a suction duct port, said suction duct being spaced from said central shell.

14. The scroll machine according to Claim 12 wherein said drive shaft has a first drive flat at a first end engaging said first scroll compressor and a second drive flat at a second end engaging said second scroll compressor, said first and second drive flats being out of rotational phase with one another by 180°.

15. The scroll machine in accordance with Claim 12, wherein said motor comprises:

- a stator attached to said outer shell; and
- a rotor attached to said drive shaft.

16. The scroll machine in accordance with Claim 12, wherein said first scroll compressor comprises:

- a first scroll member having a first spiral wrap projecting outwardly from a first end plate;

- a second scroll member having a second spiral wrap projecting outwardly from a second end plate, said second scroll wrap being interleaved with said first spiral wrap to define a first plurality of moving chambers therebetween when said second scroll member orbits with respect to said first scroll member; and

- a first main bearing housing attached to said outer shell, said first main bearing housing rotatably supporting said drive shaft.

17. The scroll machine in accordance with Claim 16, wherein said second scroll compressor comprises:

a third scroll compressor having a third spiral wrap projecting outwardly from a third end plate;

a fourth scroll member having a fourth spiral wrap projecting outwardly from a fourth end plate, said fourth scroll wrap being interleaved with said third spiral wrap to define a second plurality of moving chambers therebetween when said fourth scroll member orbits with respect to said third scroll member; and

a second main bearing housing attached to said outer shell, said second main bearing housing rotatably supporting said drive shaft.

18. The scroll machine in accordance with Claim 13, wherein said outer shell defines a suction pressure chamber in communication with said first and second scroll compressors, a first discharge pressure chamber in communication with said first scroll compressor and a second discharge chamber in communication with said second scroll compressor.

19. The scroll machine in accordance with Claim 18, wherein said first and second scroll compressors are disposed within said suction pressure chamber.

20. The scroll machine in accordance with Claim 12, further comprising a first capacity modulation system for varying the capacity of said first scroll compressor.

21. The scroll machine in accordance with Claim 20, wherein said first capacity modulation system includes a pulse width modulation system.

22. The scroll machine in accordance with Claim 21, further comprising a second capacity modulation system for varying the capacity of said second scroll compressor.

23. The scroll machine in accordance with Claim 22, wherein said first capacity modulation system includes a first pulse width modulation system and said second capacity modulation system includes a second pulse width modulation system.

24. The scroll machine in accordance with Claim 12, wherein said motor is a variable speed motor.

25. A scroll machine comprising:  
an outer shell defining a central shell and a suction duct having a suction port, said suction duct being spaced from said central shell;

a first scroll compressor disposed within said outer shell, said first scroll compressor providing compressed fluid to a first discharge chamber in communication with said discharge duct;

a second scroll compressor disposed within said outer shell, said second scroll compressor providing compressed fluid to a second discharge chamber in communication with said discharge duct;

a draft shaft extending between and couple to each of said first and second scroll compressors; and

a motor disposed within said outer shell between said first and second scroll compressors, said motor being drivingly coupled to said drive shaft.

26. The scroll machine in accordance with Claim 25, wherein said motor comprises:

a stator attached to said outer shell; and

a rotor attached to said drive shaft.

27. The scroll machine in accordance with Claim 25, wherein said first scroll compressor comprises:

a first scroll member having a first spiral wrap projecting outwardly from a first end plate;

a second scroll member having a second spiral wrap projecting outwardly from a second end plate, said second scroll wrap being interleaved with said first spiral wrap to define a first plurality of moving chambers



therebetween when said second scroll member orbits with respect to said first scroll member; and

a first main bearing housing attached to said outer shell, said first main bearing housing rotatably supporting said drive shaft.

28. The scroll machine in accordance with Claim 27, wherein said second scroll compressor comprises:

a third scroll compressor having a third spiral wrap projecting outwardly from a third end plate;

a fourth scroll member having a fourth spiral wrap projecting outwardly from a fourth end plate, said fourth scroll wrap being interleaved with said third spiral wrap to define a second plurality of moving chambers therebetween when said fourth scroll member orbits with respect to said third scroll member; and

a second main bearing housing attached to said outer shell, said second main bearing housing rotatably supporting said drive shaft.

29. The scroll machine in accordance with Claim 25, wherein said outer shell defines a suction pressure chamber in communication with said first and second scroll compressors, a first discharge pressure chamber in communication with said first scroll compressor and a second discharge chamber in communication with said second scroll compressor.

30. The scroll machine in accordance with Claim 29, wherein said first and second scroll compressors are disposed within said suction pressure chamber.

31. The scroll machine in accordance with Claim 25, further comprising a first capacity modulation system for varying the capacity of said first scroll compressor.

32. The scroll machine in accordance with Claim 31, wherein said first capacity modulation system includes a pulse width modulation system.

33. The scroll machine in accordance with Claim 32, further comprising a second capacity modulation system for varying the capacity of said second scroll compressor.

34. The scroll machine in accordance with Claim 33, wherein said first capacity modulation system includes a first pulse width modulation system and said second capacity modulation system includes a second pulse width modulation system.

35. The scroll machine in accordance with Claim 25, wherein said motor is a variable speed motor.

36. A scroll machine comprising:

- an outer shell;
- a first scroll compressor disposed within said outer shell;
- a second scroll compressor disposed within said outer shell;
- a drive shaft extending between and couple to each of said first and second scroll compressors;
- an oil pump driving by said drive shaft, said oil pump providing lubricating oil to said first and second scroll compressors through a passage defined by said drive shaft;
- a motor disposed within said outer shell between said first and second scroll compressors, said motor being drivingly coupled to said drive shaft.

37. The scroll machine according to Claim 36 wherein said outer shell defines a suction duct having a suction port, said suction duct being spaced from said outer shell.

38. The scroll machine according to Claim 36 wherein said drive shaft has a first drive flat at a first end engaging said first scroll compressor and a second drive flat at a second end engaging said second scroll compressor, said first and second drive flats being out of rotational phase with one another by 180°.

39. The scroll machine in accordance with Claim 36, wherein said motor comprises:

a stator attached to said outer shell; and

a rotor attached to said drive shaft.

40. The scroll machine in accordance with Claim 36, wherein said first scroll compressor comprises:

a first scroll member having a first spiral wrap projecting outwardly from a first end plate;

a second scroll member having a second spiral wrap projecting outwardly from a second end plate, said second scroll wrap being interleaved with said first spiral wrap to define a first plurality of moving chambers therebetween when said second scroll member orbits with respect to said first scroll member; and

a first main bearing housing attached to said outer shell, said first main bearing housing rotatably supporting said drive shaft.

41. The scroll machine in accordance with Claim 40 wherein said second scroll compressor comprises:

a third scroll compressor having a third spiral wrap projecting outwardly from a third end plate;

a fourth scroll member having a fourth spiral wrap projecting outwardly from a fourth end plate, said fourth scroll wrap being interleaved with

said third spiral wrap to define a second plurality of moving chambers therebetween when said fourth scroll member orbits with respect to said third scroll member; and

a second main bearing housing attached to said outer shell, said second main bearing housing rotatably supporting said drive shaft.

42. The scroll machine in accordance with Claim 36, wherein said outer shell defines a suction pressure chamber in communication with said first and second scroll compressors, a first discharge pressure chamber in communication with said first scroll compressor and a second discharge chamber in communication with said second scroll compressor.

43. The scroll machine in accordance with Claim 42, wherein said first and second scroll compressors are disposed within said suction pressure chamber.

44. The scroll machine in accordance with Claim 36, further comprising a first capacity modulation system for varying the capacity of said first scroll compressor.

45. The scroll machine in accordance with Claim 44, wherein said first capacity modulation system includes a pulse width modulation system.

46. The scroll machine in accordance with Claim 45, further comprising a second capacity modulation system for varying the capacity of said second scroll compressor.

47. The scroll machine in accordance with Claim 46, wherein said first capacity modulation system includes a first pulse width modulation system and said second capacity modulation system includes a second pulse width modulation system.

48. The scroll machine in accordance with Claim 36, wherein said motor is a variable speed motor.

49. A scroll machine comprising:

an outer shell defining a central shell, defining a suction chamber and a discharge duct having a discharge port, said discharge duct being spaced from said central shell;

a first end cap attached to a first end of said central shell, said first end cap defining a first discharge passage in communication with said discharge duct, said first end cap defining said suction chamber;

a second cap attached to a second end of said central shell, said second end cap defining a second discharge passage in communication with said discharge duct, said second end cap defining said suction chamber;

a first scroll compressor disposed within said outer shell;

a second scroll compressor disposed within said outer shell;  
a drive shaft extending between and coupled to each of said first and second scroll compressors; and  
a motor disposed within said outer shell between said first and second scroll compressions, said motor being drivingly coupled to said drive shaft.

50. The scroll machine according to Claim 49 wherein said drive shaft has a first drive flat at a first end engaging said first scroll compressor and a second drive flat at a second end engaging said second scroll compressor, said first and second drive flats being out of rotational phase with one another by 180°.

51. The scroll machine in accordance with Claim 49, wherein said motor comprises:

a stator attached to said outer shell; and  
a rotor attached to said drive shaft.

52. The scroll machine in accordance with Claim 49, wherein said first scroll compressor comprises:

a first scroll member having a first spiral wrap projecting outwardly from a first end plate;

a second scroll member having a second spiral wrap projecting outwardly from a second end plate, said second scroll wrap being interleaved with said first spiral wrap to define a first plurality of moving chambers therebetween when said second scroll member orbits with respect to said first scroll member; and

a first main bearing housing attached to said outer shell, said first main bearing housing rotatably supporting said drive shaft.

53. The scroll machine in accordance with Claim 52, wherein said second scroll compressor comprises:

a third scroll compressor having a third spiral wrap projecting outwardly from a third end plate;

a fourth scroll member having a fourth spiral wrap projecting outwardly from a fourth end plate, said fourth scroll wrap being interleaved with said third spiral wrap to define a second plurality of moving chambers therebetween when said fourth scroll member orbits with respect to said third scroll member; and

a second main bearing housing attached to said outer shell, said second main bearing housing rotatably supporting said drive shaft.

54. The scroll machine in accordance with Claim 49, further comprising a first capacity modulation system for varying the capacity of said first scroll compressor.



55. The scroll machine in accordance with Claim 54, wherein said first capacity modulation system includes a pulse width modulation system.

56. The scroll machine in accordance with Claim 55, further comprising a second capacity modulation system for varying the capacity of said second scroll compressor.

57. The scroll machine in accordance with Claim 56, wherein said first capacity modulation system includes a first pulse width modulation system and said second capacity modulation system includes a second pulse width modulation system.

58. The scroll machine in accordance with Claim 49, wherein said motor is a variable speed motor.